Health Consultation

Former Knott Foundry
Bellingham, Whatcom County, Washington

October 29, 2001

Prepared by

The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond quickly to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

For additional information or questions regarding DOH, ATSDR or the contents of this Health Consultation, please call the health advisor who prepared this document:

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Glossary

Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Chronic	A long period of time. A chronic exposure is one which lasts for a year or longer.
Comparison value	A concentration of a chemical in soil, air or water that, if exceeded, requires further evaluation as a contaminant of potential health concern. The terms comparison value and screening level are often used synonymously.
Contaminant	Any chemical that exists in the environment or living organisms that is not normally found there.
Dose	A dose is the amount of a substance that gets into the body through ingestion, skin absorption or inhalation. It is calculated per kilogram of body weight per day.
Exposure	Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short-term (acute) or long-term (chronic).
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Indeterminate public health hazard	Sites for which no conclusions about public health hazard can be made because data are lacking.

Ingestion rate	The amount of an environmental medium which could be ingested typically on a daily basis. Units for IR are usually liter/day for water, and mg/day for soil.
Lowest Observed Adverse Effect Level (LOAEL)	LOAELs have been classified into "less serious" or "serious" effects. In dose-response experiments, the lowest exposure level at which there are statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control.
Model Toxics Control Act (MTCA)	The hazardous waste cleanup law for Washington State.
No Observed Adverse Effect Level (NOAEL)	The dose of a chemical at which there were no statistically or biologically significant increases in frequency or severity of adverse effects seen between the exposed population and its appropriate control. Effects may be observed at this dose but were judged not to be "adverse."
Parts per billion (ppb)/Parts per million (ppm)	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE.
Route of exposure	The way in which a person my contact a chemical substance that includes ingestion, skin contact and breathing.

Background and Statement of Issues

This health consultation was prepared at the request of Whatcom County Health and Human Services to evaluate the potential health hazard posed by metals in soil at a residence adjacent to the former Knott Foundry site located in Bellingham, Whatcom County, Washington. DOH prepares health consultations under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

The former Knott Foundry site is located behind a residence at 3123 Alderwood Avenue (Figure 1). It reportedly began operations in the early 1900s making stove pipes and cast metal products. The foundry is no longer active. A resident living adjacent to the former foundry expressed concerns about metals in soil on the property because a portion of the resident's property contains land from the former foundry. One of the foundry buildings burned to the ground many years ago, and the remaining foundation was used as a dumping ground for various wastes.[1] This dumping ground is located in the rear corner of the back yard and is approximately 900 square feet in size.[2]

Soil samples were reportedly taken by a consultant hired by the former land owner before May 1996, and inquiries were made to the Department of Ecology (Ecology) on how to clean up metal contaminated soil resulting from past foundry activities. The results of the sampling are unknown, because a report was never received by Ecology, and the consulting company has since gone out of business. The former owner has moved out of state, and the analytical laboratory that likely processed the samples has discarded the results. The consultant, however, apparently recommended removing between 30- 40 cubic yards of soil due to metals contamination.

Whatcom County Health and Human Services collected three soil samples on April 18, 2001, from the back yard of the residence in the vicinity of the burned down building. The samples were analyzed for metals, and 2 of the 3 samples contained metals at levels that exceeded comparison values (Table 1).

Table 1. Metals at levels exceeding comparison values in surface soils at residential properties near the former Knott Foundry.

Sample	Contaminant of Concern	Contaminant Level (ppm)	Comparison Value (ppm)	Source
2	Copper	3180	2960	MTCA (B)[b]
3	Copper	11900	2960	MTCA (B)
3	Lead	1700	250	MTCA(A)[a]

[a] Model Toxics Control Act Method A - Soil Cleanup Level

[b] Model Toxics Control Act Method B - Soil Cleanup Level

Discussion

Lead was found in 1 of 3, and copper in 2 of 3 samples at levels above the MTCA cleanup levels. Prior sampling by a consultant also reported metal contaminated soil. The current resident has indicated that the area of his property that is suspected to be contaminated with metals is not used as a vegetable garden, therefore, the main exposure pathway of concern in this case is direct contact with contaminated soil. As a worst-case scenario, the following evaluation assumed that the soil is available for contact by children six years of age or less. It is understood that no young children currently reside on the property. However, childhood exposure was evaluated in order to assess the potential for future exposures.

Lead is a naturally occurring element that is found at low levels in undisturbed soils. In the Puget Sound region of Washington State, the background soil lead concentration ranges between 5 and 30 ppm.[3]

Past uses of lead in paint, gasoline, plumbing, pesticides and canning have contributed to wide-spread dispersion of lead and subsequent human exposure. Elimination of lead in gasoline and solder used in canning has greatly reduced exposure to lead through inhalation and ingestion pathways. As a result, the number of one to 5-year-old children in the U.S. with elevated blood lead levels has dropped from 88.2% in the late 1970s, to 4.4% in the early 1990s.[4] Currently, the main pathways of lead exposure in children are ingestion of paint chips, contaminated soil and house dust, and drinking water in homes with old plumbing.

Lead can cause a wide array of health effects in different systems of the body, but the primary target is the nervous system. Children less than seven years old are more susceptible to lead exposure and more sensitive to its toxicity than adults. Health effects include decreased IQ, decreased attention span, and irritability.[5] The Centers for Disease Control (CDC) considers a level of 10 micrograms/deciliter (µg/dl) or more to be an indication of excessive lead exposure.

If children less than 7 years of age were exposed to the maximum lead concentration detected in soil (1700 ppm), EPA=s Integrated Exposure Uptake Biokinetic (IEUBK) model estimates that a significant percentage would have blood lead levels in excess of 10 µg/dl. The model assumes that the child is exposed to a uniform soil concentration of 1700 ppm. While lead in soil is certainly not uniformly distributed, this assumption is designed to be protective of human health because the true nature and extent of contamination in the yard is not known.

A scenario involving childhood ingestion of the maximum level of copper contaminated soil was used to calculate an estimated exposure dose. The estimated dose was compared to the lowest observed adverse effect level (LOAEL). The LOAEL for copper (0.05 mg/kg/day) is a dose in which gastrointestinal discomfort has been experienced by humans.[6]

The calculated copper exposure dose exceeds the LOAEL indicating that children that played in the contaminated soil might experience adverse health effects should they chronically and inadvertently ingest soil. While there are no young children currently living at the site,

contaminated soil on site might pose a threat to children living there in the future.

Child Health Initiative

ATSDR recognizes that infants and children may be more vulnerable to exposures than adults when faced with contamination of air, water, soil, or food.[7] This vulnerability is a result of the following factors:

- Children are more likely to play outdoors and bring food into contaminated areas.
- Children are shorter and their breathing zone is closer to the ground, resulting in a greater likelihood to breathe dust, soil, and heavy vapors.
- Children are smaller and receive higher doses of chemical exposure per body weight.
- Children's developing body systems are more vulnerable to toxic exposures, especially during critical growth stages in which permanent damage may be incurred.

Though no young children currently reside at the residence adjacent to the former Knott Foundry, exposure doses were calculated for children in order to account for future exposures.

Conclusion

An indeterminate public health hazard exists for residents exposed to metals in soil at properties adjacent to the former Knott Foundry. Past sampling revealed that soil on a portion of residential property was contaminated with metals as a result of foundry operations. The results of these samples, however, have been lost. An additional sampling event conducted by Whatcom County Health and Human Services revealed levels of lead and copper above comparison values. The limited number of samples does not provide information on the extent of contamination, but the maximum levels of lead and copper detected in soil could potentially represent a health hazard to young children.

Recommendations

- Efforts to reach the former owner of the property should be made in order to obtain the results of the past sampling.
- If the results of the past sampling cannot be found, then another round of soil sampling should be conducted in order to determine the nature and extent of contamination at the site.

_____DOH is available to evaluate future sampling data gathered from this site.

- Reduce exposure to metals through the following precautionary measures:
    - Avoid vegetable gardening in the contaminated area.
    - Avoid direct contact with contaminated soil. Stay away from contaminated areas and/or wear protective clothing.
    - Reduce the amount of contaminated soil that is tracked into the home.

      Contaminated soil can accumulate indoors resulting in exposure via direct contact or inhalation. Use work clothes when doing yard work that might result in contact with contaminated soil. These work clothes should then be removed before entering the house to avoid tracking in contaminated soil.

Preparer of Report

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References

1. Whatcom County Health and Human Services. Site Hazard Assessment. August 28, 2001.

2. Personal Communication with resident. August 29, 2001.

3. Washington State Department of Ecology. Natural Background Soil Metals Concentrations in Washington State. October 1994. Publication No. 94-115.

4. Center for Disease Control. CDC's Lead Poisoning Prevention Program. http:/ / www.cdc.gov/ nceh/ lead/ factsheets/ leadfcts.htm. Last Updated March 3, 2001.

5. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Lead. US Department of Health and Human Services, Public Health Service, July 1999.

6. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Copper. US Department of Health and Human Services, Public Health Service, December 1990.

7.Agency for Toxic Substances and Disease Registry. Interim guidance on including child health issues in Division of Health Assessment and Consultation Documents. Atlanta: US Department of Health and Human Services, Public Health Service, July 1998.

Certification

This Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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Figure 1 - Site Location, and Demographic Statistics Within a Half Mile of the Site*

Total Population	2421
White	2250
Black	14
American Indian, Eskimo, Aleut	56
Asian or Pacific Islander	75
Other Race	25
Hispanic Origin	58
Children Aged 6 and Younger	222
Adults Aged 65 and Older	395
Females Aged 15 - 44	612
Total Aged over 18	1893
Total Aged under 18	528
Total Housing Units	1053

*Calculated using the area proportion technique. Source: 1990 U.S. CENSUS